

TRAINING FOR THE USE OF E-LEARNING TOOLS FOR SPECIALISTS IN THE NUCLEAR SECTOR OF LATIN AMERICA AND THE CARIBBEAN

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ABSTRACT

The Latin American Network for Education and Training in Nuclear Technology (LANENT) and the International Atomic Energy Agency (IAEA) developed a course to introduce the use of e-learning tools and to present the processes and stages involved in the planning, development and implementation of an online course. The training involved experts of the nuclear sector, from the LANENT community of Latin American and Caribbean countries, that are directly responsible for the education and/or training of their institutions. The collaborative work performed by a team of consultants to prepare the course shared a virtual office in the Moodle platform of the LANENT portal as well as periodic meetings through videoconferences, via Webex, to review advances and coordination. The modules of the course were implemented in a scorm format as reusable digital learning objects and were arranged in the virtual classroom for the participants. Moreover, its instructional design included a one-month online pre-training phase and 40 hours of self-learning in a virtual learning environment available at the LANENT portal which was followed by a 5-day face-to-face training sessions of 35 hours at the Metropolitan University of Education- UMCE, in Santiago – Chile. The first course started in 2015 in Santiago, Chile, with 11 professionals from 6 countries and the second one in 2016 in Lima, Peru with 18 professionals from 7 countries. Participating professionals had the opportunity to analyse the dimensions of pedagogical and technological management in the implementation of e-learning methodologies and to learn tools of authoring interactive digital content and to build a community of practice. The participants of the two editions are connected in a community of practice to continue working collaboratively, expanding their new knowledge and skills on e-learning for their education/training/dissemination engagements on the themes of their professional activities in the nuclear field. To reinforce the concepts learned, they are currently organized into four groups to planning an instructional design to offer online courses in the following subjects: Radiological protection, Introduction to Nuclear Energy, Effect of non-ionizing radiation, especially cellular and Responses to Emergencies, respectively. The results achieved exceeded expectations, translating into an effective educational strategy for the training of nuclear professionals in e-learning methodologies.

1. Introduction

The Regional Introductory Training Course on the Use of e-Learning Tools as a Support to Nuclear Education and Training, emerged from the Consultants Meeting held at the Metropolitan University of Education Sciences (UMCE) and at the Center for Studies Nuclear La Reina of the Chilean Nuclear Energy Commission (CCHEN), in Santiago de Chile, under the auspices of the IAEA and as part of the activities of the RLA-0048 Project of the LANENT Network. The members of LANENT working groups have considered that it would be important for the region to provide an opportunity for training in e-learning through a hybrid course, implemented in two successive stages - online and face-to-face - demonstrating the potential of self-managed learning mediated by ICTs and the advantages of a set of tools for the design, implementation and evaluation for education and / or training in the nuclear field. For this, it has been determined to offer training alternatives at different levels, which facilitate the work of teachers and trainers. As a first step in this regard, it was decided to design and implement an introductory course on the possibilities offered by the e-learning teaching modality in its different forms, aimed at teachers and trainers. The Meeting of Consultants on Training of Teachers and Trainers for Creation and Implementation of Courses of Nuclear Matters in e-Learning Mode had the following objectives:

1. Create a course on e-learning (structure, content selection and technological tools) to provide guidance and support to university professors for the development of online courses in the field of nuclear applications.
2. Develop at least the following tasks for the course: selection of content specialists, methodologies and technological tools, and determination of responsibilities; instructional design; development of teaching material for online learning; implementation and distribution of the course and methods of management and evaluation.

1.1 Course structure and modeling

The course was developed in "blended-learning" mode, starting with a pre-training stage carried out through the Educational Portal of the LANENT Network and a face-to-face stage. The course focuses on the promotion of e-learning as a teaching method that can be used for various educational and training scenarios on the peaceful uses of nuclear technology. It provides pedagogical knowledge on instructional design and evaluation for this teaching methodology, and practice opportunities with multimedia tools for the production of teaching material, as well as management of the Moodle computer platform that the IAEA has made available to regional networks for Education and training mediated by information and communication technologies.

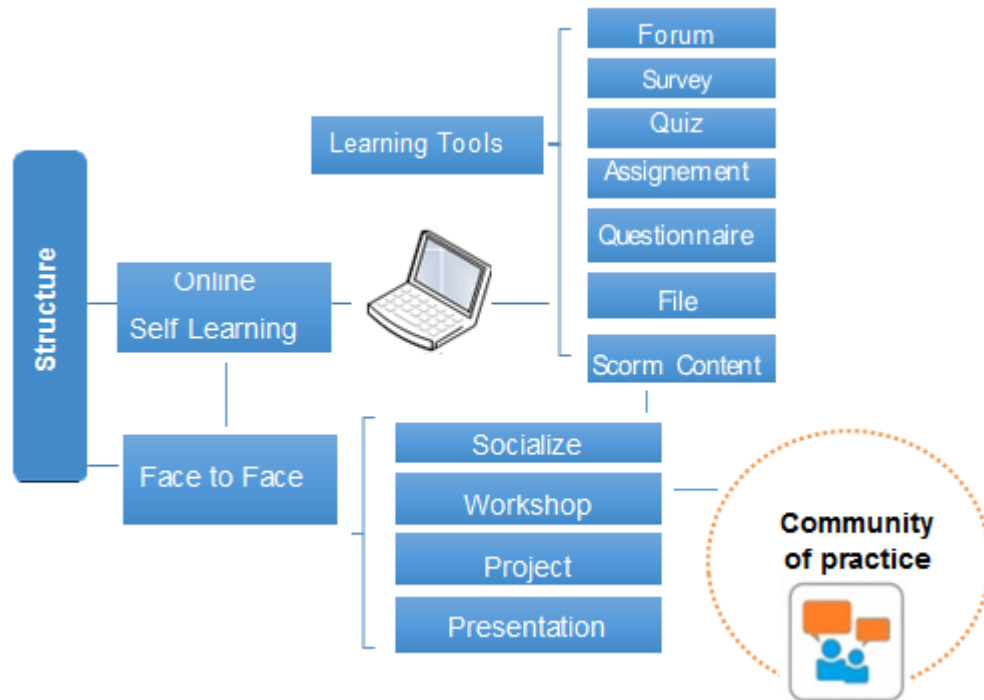


Fig 1: Course structure

1.2 Pedagogical Planning and Production

The pedagogical planning of the course was a fruit of the Meeting of Consultants in Santiago in December 2014, giving rise to an intense collaborative work in network for the production of contents, learning activities, didactic and evaluation resources throughout 2015, between the months of January and September. In this period, the support of the IAEA through the Webex system for video conferencing and the access to the Moodle computer platform through LANENT Educational Portal, installed on a server of the CNEA in Argentina, was of vital importance. The instructional design of the course included a one-month online pre-training phase and 40 hours of self-managed independent study in a virtual classroom implemented in the LANENT portal, followed by a 5-day face-to-face training phase (35 hours). [1] The contents were defined to be developed in two stages. The first, online (self learning) and the second, face-to-face, with the following purposes:

A) Online

- Present the basic concepts related to the e-learning modality, understood as a way of teaching aimed at promoting autonomous learning mediated with computer and communications technologies;
- Review, at an introductory level, a set of technological tools to design and implement e-learning courses.

B) Face-to-face

- Reinforce and socialize learning outcomes on the basics of the online stage;
- Practice the use of technological tools for e-learning reviewed in the online stage;
- Apply e-learning tools to the design of an online pilot course on topics of interest and specialty of each participant.

The contents of the course were structured in 6 modules:

Module 1 - Presentation

Module 2 - Introduction to E-learning

Module 3 - E-learning: Content Dimension

Module 4 - E-learning: Pedagogical Dimension

Module 5 - E-learning: Technological Dimension

Module 6 – E-learning: Management Dimension

Learning outcomes:

- Understand the basic processes and steps involved in planning, developing and implementing an online course in its different variants and dimensions: self-learning or guided by a synchronous or asynchronous tutor etc;
- Analyze the pedagogical and management aspects of each dimension involved in the creation of an online course;
- Know the role of a working group to implement e-learning methodology;
- know some of the tools integrated in the various stages of the process and their use, with examples related to the most used;
- Understand basic technology requirements in online courses.

1.2.1 Structure to create the contents of each module

Each module was developed with a common structure, according to the instructional design expected for the course, as this example:

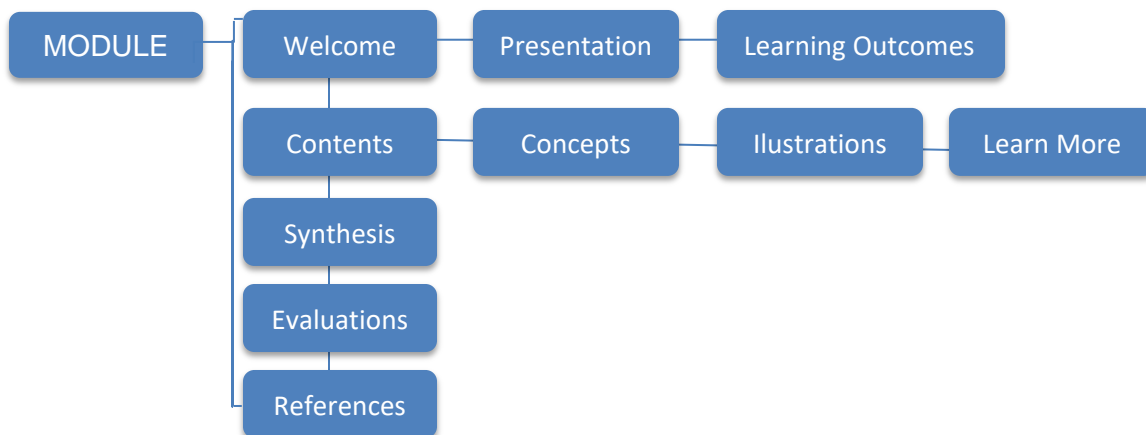


Fig. 2: Structure to create the contents of each module

1.3 Implementation of the Pre-Training - Online

The virtual pre-training stage of the course was implemented in the LMS Moodle environment of the LANENT Network. The main functionalities available in Moodle allow communication and interaction to be established, publication of contents, accomplishment of tasks (lessons) and evaluations of the learning.

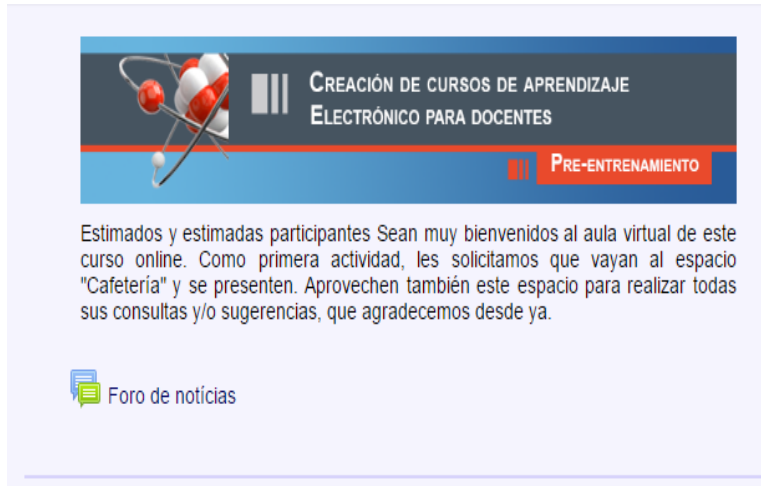
1.3.1 Contents, Activities and Evaluation

The virtual learning environment Moodle was organized to provide participants with autonomy of study, considering the premise of being a stage of self learning. As it is a project for the countries of Latin America and the Caribbean, the language adopted in the course is Spanish. The learning virtual environment selected for the course was the Moodle platform Moodle (<https://plms.lanentweb.org/>). It is an environment for the creation, participation and administration of courses on the Web, free and open source, presented during the course and in face-to-face meetings, when a workshop is developed for its initial exploration.

A presentation video was produced, which was included in the Moodle virtual classroom of the course, and socialization and learning forums were set up. In addition, 3 tasks were scheduled for intermediate evaluations, and a tutorial feedback service was provided by UMCE professionals for those who would like to request it.



Fig 3: Welcome Presentation Video (Scorm Package)



CREACIÓN DE CURSOS DE APRENDIZAJE
ELECTRÓNICO PARA DOCENTES

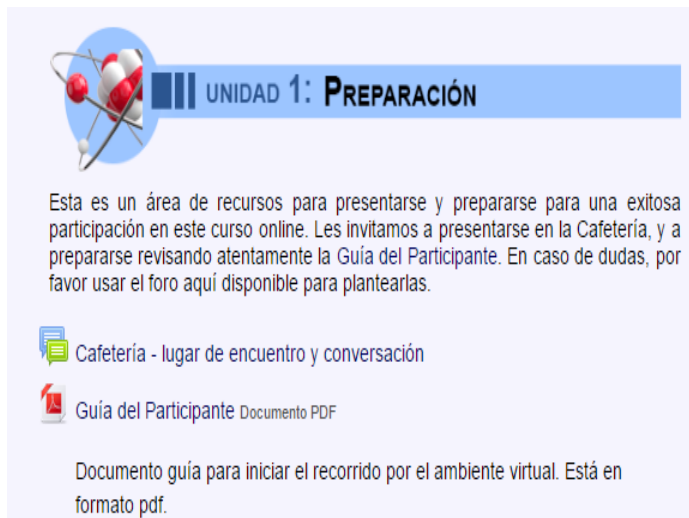
PRE-ENTRENAMIENTO

Estimados y estimadas participantes Sean muy bienvenidos al aula virtual de este curso online. Como primera actividad, les solicitamos que vayan al espacio "Cafetería" y se presenten. Aprovechen también este espacio para realizar todas sus consultas y/o sugerencias, que agradecemos desde ya.

Foro de noticias

Fig 4: Welcome to the Course (Moodle Content)

There is a space in which the participants find the main information about the course, as well as an invitation to introduce themselves to the other participants. (*Cafeteria*) In addition, they can access the Course Guide to obtain all the information about how the course is organized.



UNIDAD 1: PREPARACIÓN

Esta es un área de recursos para presentarse y prepararse para una exitosa participación en este curso online. Les invitamos a presentarse en la Cafetería, y a prepararse revisando atentamente la Guía del Participante. En caso de dudas, por favor usar el foro aquí disponible para plantearlas.

Cafetería - lugar de encuentro y conversación

Guía del Participante Documento PDF

Documento guía para iniciar el recorrido por el ambiente virtual. Está en formato pdf.

Fig. 5: Course Information

The specific content of the online course is presented in order to allow an autonomous and self-managing navigation for each participant to their own style and pace of learning. The content is distributed in 6 modules, available in two parts. Also, the forum is accessed on the contents and space of tasks prescribed in some of the modules, for sending them to the tutors and receiving feedback. The

virtual environment provides digital content, additional bibliography to enrich and deepen learning, useful links to complement the training and a glossary. Partial exams are used at the end of each module, which can be repeated until the required minimum knowledge is reached. A final evaluation of the course, of multiple choice type, is made and can be repeated. It can only be done after successful completion of the partial evaluations.

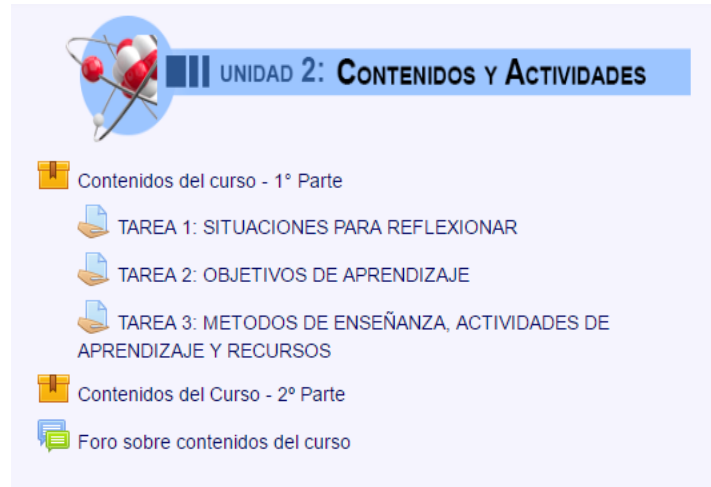


Fig 6: Contents and Activities

1.3.2 Content in scorm format

The digital content of the course was developed through the Articulate authoring software (<https://articulate.com/>). After creating the e-learning project with this authoring tool a scorm content package is generated to publish in the virtual learning environment (LMS platform). Some examples of scorm format content created in accordance with the instructional design of the course [3]:

Sample Text:



Fig 7: Example Scorm Content – Sample Text

Interactive content in scorm format

The screenshot shows a web page with a navigation bar at the top containing five tabs: Tab 1 (orange), Tab 2 (green), Tab 3 (blue), Tab 4 (red), and Tab 5 (purple). The main content area is titled "Beneficios de e-learning" and contains text about the benefits of online learning, a 3D character sitting at a laptop, and a call to action: "Haga clic en cada una de las Tab y conozca las ventajas de utilizar E-learning." To the right, there is a section titled "Situaciones para la Reflexión" with a text prompt: "Considere las siguientes situaciones y reflexione sobre una práctica adecuada. A través del curso usted encontrará más ayudas para las decisiones que ahora se presentan." Below the text are four vertical bars representing "Situación 1" (blue), "Situación 2" (purple), "Situación 3" (red), and "Situación 4" (green).

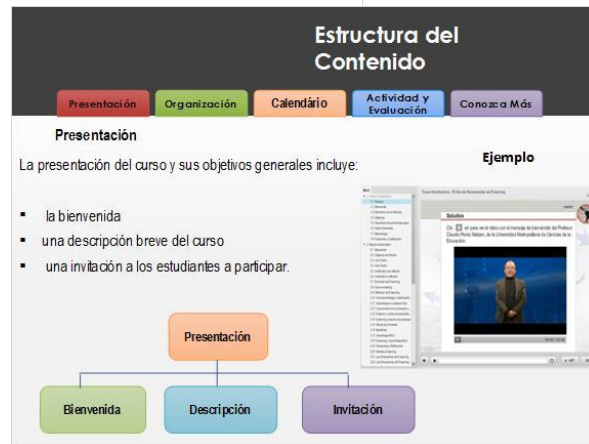


Fig 8: Interactive content in scorm format (Example)

1.4 Face to Face

The course as a whole is anchored in the development of a project. The participant should, from the definition of the theme, organize the planning and detailed educational design and then implement in the Moodle environment. The implementation of the courses in the Moodle environment counts on the elaboration of the graphic design as insertion of images, animations, videos and suggestions of addresses in the internet and the organization and structure of the virtual environment. At the beginning of the course students take up a student role in the Moodle environment and.

In the face to face phase the participants should create a course project, applying the knowledge learned in the online step. Moodle environments are created for each participant can act as an educational planner and designer. Therefore,

throughout the course they have two courses in the environment: the Pre-Training course and the course they develop. It is an opportunity to articulate and practice, according to the methodological proposal of training in action.

After the implementation, each participant presents his / her project and analyzes the projects of the participants, seeking together to identify points to be adjusted and improved, thus exercising the collective construction of knowledge.

The face-to-face stage, considered a fundamental part of the practice of e-learning, provided the participants with practical training in computer lab 8 h / day * 5 days; use of software tools deployed in a special section of the virtual classroom; group discussions on e-learning for nuclear education and training; individual / couple working on small sample projects and course evaluation.

The expected results were successful, giving participants the opportunity to:

- Discussion of the main barriers commonly argued against e-learning, in comparison with traditional teaching methods and resources;
- Demonstration of the possibilities and opportunities of e-learning/b-learning for nuclear education and training in the region, through individual immersion on a pre-training stage about those topics using a LMS;
- Practical learning of ICT tools, through individual and group hands-on work about resources for production, delivery, managing and assessment of e-learning/b-learning courses;
- Exploration of needs and expectations for future courses on nuclear education and training in the region, to be built in collaboration, thanks to the develop of a community of practice.

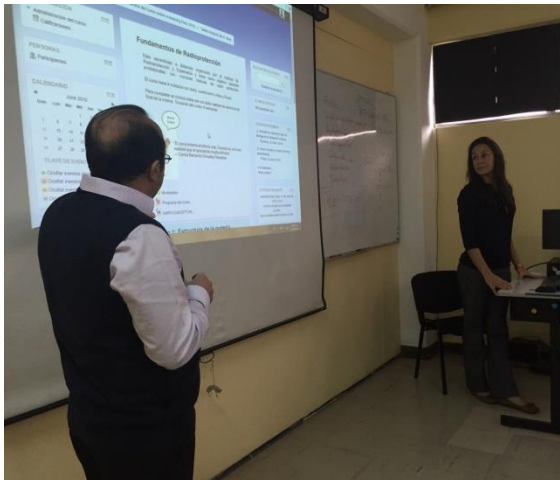


Fig 9: Participants presenting their project



Fig 10: Workshop

1.5 Community of Practice

After the face-to-face stage, the participants decided to stay connected to continue working collaboratively and expanding their new knowledge and skills on this teaching modality for their education / training / dissemination engagements in their professional activities in the nuclear field. It is taking advantage of the virtual classroom of the course in the LANENT Portal, to shape that community of practice on e-learning for education and training in nuclear technology. This community of practice works collaboratively in the following purposes:

- Review the evaluation of the course and suggest improvements for a new version, which can be implemented in the same modality of two stages, online and in person, for new stakeholders of the nuclear field of the region;
- Apply the knowledge and skills acquired in the course on e-learning to the collaborative network design and production of a nuclear content course, to be implemented in the region from 2017.

Also, IAEA Webex videoconference meetings have been held to plan and start the committed tasks, since it is programmed to offer the version of this course on e-learning to a new group of participants.

Conclusions

The course has grown the community of practice, created in its first version in Santiago de Chile, from 11 to 36 members plus the teaching staff. The theoretical and practical lessons exceeded the expectations of teachers and participants. Hence, it is expected that future projects continue providing specific training to more Latin American and Caribbean professionals. The aim is to apply the knowledge acquired in the creation of e-learning courses in topics defined according to the interest of the participants and the priorities defined in the strategic profile of the region. The results achieved accomplished the goal of translating into a complete design, production and implementation plan for an introductory course on e-learning, to be taught in two successive stages, online pre-training and face-to-face training.[2]

References

- [1]Term of reference: Introductory course to the use of e-learning tools as a support for education and training in the nuclear sector pre-training in e-learning modality. Group of IAEA/LANENT/UMCE, Santiago, Chile, 2015.
- [2]Matzen, C.P. Mission Term Report - Project RLA 0048. Santiago, Chile, 2016.
- [3] José, M.A. Mission Term Report - Project RLA 0057. São Paulo, Brazil, 2016.